

## HAIR STYLING APPARATUS

### FIELD OF THE INVENTION

This invention relates to hair styling means and apparatus and, more particularly, to hair styling irons such as hair curling irons and hair straightening  
5 irons with a rotatable styling head. More specifically, although of course not solely limited thereto, this invention relates to handheld hair styling irons and more particularly to handheld hair styling irons with detachable and rotatable styling heads.

### BACKGROUND OF THE INVENTION

10 Hair styling apparatus are widely used in hair applications. A common type of hair styling apparatus is tong-shaped and comprises a pair of hinged arms with a pair of heated styling heads, which are mounted on the free ends of the hinged arms with the styling surfaces facing each other. Hair is typically styled, for example, by a pair of curling or straightening heads, when the pair of heated  
15 styling heads is in compressive engagement. Another common type of hair styling apparatus is flute-shaped and comprises a handle with an elongated metallic rod which is substantially coaxial with the handle. The elongated metallic rod comprises a heated styling head and a spring-biased clamping arm, which is hinged to the apparatus near the junction between the handle and the metallic rod.  
20 Hair is compressively held between the clamp and the styling head during styling. The aforementioned hair styling apparatus are commonly and collectively known as hair styling irons.

Some conventional hair styling irons include a rotatable styling head which may be detachable. A hair styling iron with a rotatable head is beneficial since stress and strain on hair can be reduced during styling contact because, for example, of the smoother relative movements between hair and the rotatable styling head. A hair styling iron with a rotatable head is advantageous since heat on the circumference of a styling head can be utilised more efficiently and applied more evenly. For hair styling irons equipped with a detachable styling head, a variety of hair styling options can be chosen while only a single handle suffices.

Most conventional hair styling irons with a rotatable hair styling head are heated by a flow of warm air originated from the handle portion. This indirect heating of the styling head means a relatively low thermal efficiency since heat is first transferred to the vicinity of a styling head by forced convection and then to the styling head by contact conduction. In addition, because a hair styling head usually comprises a metallic styling head which is both a good thermal conductor and radiator, the downstream end of a styling head typically requires a longer time to heat up and initial uneven heating on hair can result. Furthermore, the indirection mode of heating for a handheld hair styling device also means that the operation temperature range for hair styling will be severely limited which may adversely affect styling results.

Hence, it will be desirable if improved hair styling means with a rotatable styling head which alleviate shortcomings of known hair styling apparatus is provided.

## OBJECT OF THE INVENTION

Accordingly, it is an object of this invention to provide hair styling apparatus with styling heads alleviating shortcomings of conventional designs. At a minimum, it is an object of this invention to provide the public with a useful choice of a hair styling apparatus.

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## SUMMARY OF THE INVENTION

According to the present invention, there is provided hair styling apparatus comprising a pair of pivotally connected handles and a pair of detachable styling members which are connected to the un-pivoted ends of said handles, each said styling member comprising a main housing, a styling roller, built-in heating means  
10 and an electrical adaptor, said styling roller being rotatably supported on said main housing and being rotatable about a longitudinal axis which is substantially orthogonal to the pivotal axis joining said handles, said electrical adaptor and said handle including co-operative rotary electrical interfacing means so that operating power for said heating means of said styling member can be supplied from said  
15 handle to said styling member via said rotary electrical interfacing means, wherein said styling roller being rotatable relative to said handles.

With electric heating means built-in on the styling heads/rollers and disposed proximal to the styling heads, hair styling performance is more satisfactory and thermal efficiency is enhanced.

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According to another aspect of this invention, there is provided hair styling attachments comprising a main housing, a styling roller, built-in heating means and an electrical adaptor, said styling roller being elongated and rotatably supported at its longitudinal ends on said main housing, said styling member

being rotatable about its longitudinal axis, said electrical adaptor comprises an electrical connector and co-operative rotary electrical interfacing means so that operating power for said heating means can be supplied from said electrical connector via said rotary electrical interfacing means, wherein said electrical  
5 connector being adapted for making external electrical connection.

Preferably, said pair of detachable styling members comprising cooperative styling rollers with styling surfaces which are rotate relative to each other for continuous hair styling.

Preferably, each said styling roller comprising a salient styling surface  
10 which is rotatable about a longitudinal axis, said longitudinal axis being substantially orthogonal to the pivotal axis joining said handles, said handles being pivotally movable between a hair clamping position at which position said styling members being in compressive contact and a releasing position at which position said styling members being separated, the salient styling surfaces of said styling  
15 rollers being complementary so that, when said handles being held together in said hair clamping position during hair styling application, the salient surfaces of said styling rollers being in complementary engagement such that hair is clamped between said styling rollers and can be styled by said complementary salient surfaces of said styling rollers when said styling rollers are moved along said hair.

20 Preferably, said styling roller comprising a substantially cylindrical barrel with a hair styling surface on the outside of said barrel for cooperative hair styling by the pair of hair styling roller, said styling surface being substantially symmetrical about said longitudinal axis about which said styling roller being freely rotatable.

Preferably, said electrical adaptor comprising rotary-type electrical contacts for interconnection between said heating means and the power supply.

Preferably, said electrical adaptor comprising a bayonet-type connector with a pair of axially extending rigid electrodes, said handle comprising a  
5 receptacle at its un-pivoted end for receiving said bayonet-type connector, said electrical adaptor further comprising part of a rotary-type connector on the side away from said bayonet-type connector.

Preferably, said rotary-type connector comprises a bush-and-bracket arrangement, said bracket being disposed on said electrical adaptor and said  
10 bush being disposed on said styling roller.

Preferably, said electrical adaptor comprising a bayonet-type connector with a pair of axially extending rigid electrodes, said rigid electrodes being adapted for making an external bayonet-type connection, said electrical adaptor further comprising part of a rotary-type connector on the side away from said  
15 bayonet-type connector.

Preferably, said rotary-type connector comprises a bush-and-bracket arrangement, said bracket being disposed on said electrical adaptor and said bush being disposed on said styling roller.

Preferably, said styling roller comprising a hollow barrel with a hair styling  
20 surface on the outside of said barrel for cooperative hair styling with a counterpart hair styling roller, said hair styling surface being substantially symmetrical about said longitudinal axis about which said styling roller being freely rotatable, said plastic main housing covering the longitudinal ends and a substantial

circumferential portion of said styling roller, the un-covered surface of the styling roller being for hair styling, said styling roller being supported by said main housing in a cradle-like manner.

Preferably, a bayonet-type electrical connector protrudes from said plastic  
5 main housing for making external electrical connection, said bayonet-type electrical connector being adapted for connection axially along said longitudinal axis of said styling roller.

### BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the present invention will be explained in further  
10 detail below by way of examples and with reference to the accompanying drawings, in which:-

Fig. 1 is a longitudinal cross-sectional view showing a first preferred embodiment of a hair styling apparatus of this invention with the styling members detached,

15 Fig. 1A is a transversal cross-section of the apparatus of Fig. 1 at section line AA with the styling rollers mounted,

Fig. 2 a longitudinal cross-sectional view showing the hair styling apparatus of Fig. 1 with styling members assembled,

Fig. 2A is a transversal cross-section of the styling apparatus of Fig. 2  
20 taken along section line B-B,

Fig. 3 is a longitudinal cross-sectional view showing a hair curler with a pair of detachable curling heads illustrating a second preferred embodiment of the present invention,

Fig. 3A is a transversal cross-section of the apparatus of Fig. 3 taken along  
5 section line B-B,

Fig. 4 is a schematic side view showing a hair straightener with a pair of straightening heads disassembled illustrating a third preferred embodiment of the present invention,

Fig. 5 is a longitudinal cross-sectional view showing the internal structure  
10 of the hair straightener of Fig. 4 with the styling heads assembled,

Fig. 5A is an enlarged view of the encircled portion of Fig. 5,

Figs. 5B to 5E show the transversal cross-sections along the sectional lines B-B, C-C, D-D and E-E,

Fig. 6 illustrates the hair straightener of Fig. 5 in the "opened"  
15 configuration,

Fig. 7 shows a schematic side view showing a hair curler of a fourth preferred embodiment of this invention with the curling heads detached, and

Fig. 7A is a transversal cross-section showing the cross-sections of the curling heads of Fig. 7 in co-operative and complementary engagements,

Fig. 8 is a side elevation view of a hair curling iron showing a fifth preferred embodiment of this invention,

Fig. 9A is a cross-sectional view taken along section line A-A' of Fig. 8, and illustrating the internal structure of the curling iron of Fig.8; and

Fig. 9B is cross-sectional view taken along section line B-B' of Fig. 9A, and illustrating an electricity supply mechanism of the curling iron of Fig. 8.

## 5 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figs. 1 to 2A, there is shown a hair styling apparatus illustrating a first preferred embodiment of this invention. The hair styling apparatus **100** comprises a handle **200** and a pair of detachable styling members **300**. The handle is a tong-typed handle comprising a pair of arms pivoted near  
10 their respective ends. The handle is in a "open" position and a "close" position so that tresses of hair can be released and engaged respectively by a pair of styling heads attached to the non-pivoted ends of the handle. The pair of arms are preferably ergonomically shaped and styled for comfortable use of a user. Each of the arms comprises a hollow main housing **210** so that electrical installations for  
15 styling operation can be accommodated on or within the hollow compartments defined by the main housing. The main housing can be made of durable or other plastics. An electrical power cord **220** is connected to one end of the handle for supplying operating power to the electrical parts of the styling apparatus. A swivel head is provided at the interconnecting end of the power cord to avoid cord  
20 twisting. A master electrical switch **230** is connected in series between the electrical parts and the main power supply and is mounted on the main housing. The master electrical switch can be a conventional electrical switch such as a slide switch, a push-button switch or a rocker switch. The pivotal hinge **240** joining the arms may be spring biased so that the arms are urged towards the



open position when a user is not holding the arms together. A pair of lock switches **250** is provided near the respective un-pivoted ends of the arms for interfacing and/or connection to the styling member **300**. The lock switch can be conventional lock switches known to persons skilled in the art for making secured  
5 electrical and mechanical connection between the styling members **300** and the handle **200**.

Each styling member **300** comprises a main housing **310**, a styling roller **320** and an electrical adaptor. The main housing **310** holds the electrical adapter **330** and the styling roller **320** with the styling roller freely rotatable relative to the  
10 main housing. The main housing is made of an insulating material, such as durable plastics, and is adapted so that, when the styling member is mounted on the main housing, a substantial portion of the styling roller not facing a corresponding styling member is covered while the remaining portion is exposed along its length at the region facing the corresponding styling member when  
15 mounted for operation. For example, about half of the circumferential portion of a styling member is covered. The exposed front portion of the styling member is adapted for cooperation with the exposed surface of a corresponding styling member for hair styling so that a user's hair can be compressively held between the pair of exposed styling surfaces of the styling members during normal styling  
20 operations. The covering of the back portion of the styling roller alleviates the risk of adverse inadvertent accidental contact to a user's hand or scalp, since the rollers are likely to be very hot during use.

The styling roller **320** is mounted on the plastic main housing at its longitudinal ends and comprises a substantially hollow cylindrical body with an

outer styling surface **321**. The hollow body of the styling member is made of thermally conductive materials, such as, for example, aluminium or its alloys, copper or its alloys and steel etc. The styling roller is rotatable, for example, freely rotatable, about its longitudinal axis so that, when tresses of hair user are  
5 engaged between a corresponding pair of styling members during styling operation, the styling apparatus can be moved along the length of the hair to shape a substantial length of hair without un-necessary frictional tension. The styling roller is mounted on the main housing and is supported by a pair of suspension means near its longitudinal ends for smooth relative rotation. The  
10 suspension means in the present example is a ring-shaped bush **322**, although other appropriate suspension means can also be used. With the plastic main housing supporting the longitudinal ends of the styling roller and with the back surface of the styling roller substantially covered, the styling roller is practically covered by a thermally insulative housing except at the exposed styling surfaces.  
15 Consequently and with the styling roller being cradled by the plastic main housing, a user can easily remove a hot styling member with risk of being burnt.

The electrical heater **330** is disposed inside the hollow roller body and adjacent, and preferably immediately adjacent, the outer styling surface so that the heat generated by the electrical heater can be more efficiently transmitted to  
20 the outer styling surfaces **321**. The electrical heater can be a resistive heater, an infra-red heater or other appropriate heaters. For more efficient heated hair styling, the styling roller is preferably made of a thermally conductive material such as copper and/or its alloys, aluminium and/or its alloys, nickel plated steel and the like. The electrical heater **330** is connected to a pair of rotary-type  
25 connectors for making electrical connection with a corresponding pair of

electrodes on the electrical adaptor and therefore the power supply. The rotary-type connector in the present example comprises a pair of longitudinally displaced bushes or conductive rings **340**. The pair of conductive rings is coaxially mounted on an insulated base **350** which is in turn mounted to a longitudinal end of the styling roller. The bushes can be made of, for example, copper, graphite and the like.

The electrical adaptor provides electrical interconnection between the power supply and the electrical heater and also serves as a mechanical fastener for holding the styling member onto the handle. In the present example, the electrical adaptor comprises a bayonet type connector **360** with a pair of rigid electrodes **370** extending axially away from an insulated base **380** which is attached to an axial end of the main housing **310** of the styling member. To provide electrical connection between the pair of electrodes and the lead-wire of the electrical heater so that the electrical heater can obtain operating power while the styling roller is rotating, a pair of conductive brackets **390** is attached to the main housing of the styling member to cooperate with the conductive rings to complete a rotary-type electrical connection. As can be seen from the transversal cross-sectional view of Fig. 1A, one end of the bracket **390** is attached to the main housing and the lead-wire to the electrode while the other end, the free end, is shaped to conform with the shape of the conductive ring. The bracket **390** is preferably made of a strong resilient conductive material so that the curved end of the bracket will be constantly in compressive with the conductive ring.

To further provide mechanical rigidity when the styling member has been inserted into the handle, the electrical adaptor protrudes from an axial end of the

main housing and the handle is formed with a correspondingly shaped locking receptacle to securely hold the styling member once attached.

The insulated base **380** and the pair of rigid electrodes **370** of the electrical adaptor together form a bayonet-type plug which form a secure connection with  
5 the handle when properly inserting into to a correspondingly shaped socket or receptacle on the free, un-pivoted, end of the handle. The base of the receptacle **260** comprises a pair of conductive sockets for providing snap-fit electrical connection between the power wire and the electrodes of the styling members.

Referring to Figs. 2 to 2A, the hair styling apparatus is a hair straightener  
10 **110** is in its closed configuration and the styling surfaces of the straightening rollers are in contiguous contact when the handle is in its "closed" configuration which is adapted for hair styling. Specifically, the styling member **300** comprises a straightening roller **320** having a substantially hollow and cylindrical metallic (for example, aluminium or its alloys) body with a straightening outer surface which is  
15 substantially flat and smooth for hair straightening.

Referring to Figs. 3 and 3A, there is shown a hair curler **120** illustrating a second preferred embodiment of the present invention. The hair curler comprises a handle which is identical to that shown in Fig. 1 and a pair of elongated detachable styling members as described above. Specifically, the styling member  
20 comprises a curler roller with a substantially hollow and cylindrical body on which a salient hair curling surface is formed. As shown in Fig. 3A, the salient surface on the curling roller comprises a plurality of circumferentially disposed and radially protruding curling teeth which taper away from the longitudinal axis of the curling roller. The curling teeth on the pair of curling heads are substantially

complementary so that the protruding teeth of one curling head will be received substantially within the trough between adjacent teeth on the corresponding curling head.

It will be appreciated that the styling members described above are in a modular form and as a hair styling attachment which is self-contained so that once  
5 the styling attachment is inserted into a corresponding socket on the handle, the styling attachment **300** will be operational.

Referring next to Figs. 4 to 7A, there is shown a hair straightener **1001** illustrating a third preferred embodiment of this present invention. The hair  
10 straightener **1001** comprises a pair of pivotally connected handles **1010** and a pair of elongated styling members which are respectively connected to the un-pivoted ends of the handles. The pair of elongated styling members comprises a pair of straightening heads **1020**. Each straightening head **1020** comprises an elongated barrel with a substantially cylindrical and smooth hair straightening surface.  
15 Heating means, for example, resistive heating coils **1021**, infrared or PTC heaters, are distributed underneath the cylindrical straightening surface **1022** and substantially along the effective length of the straightening head. An attachment means is formed on the straightening head for connection with the handle portion. The attachment means comprises a pair of protruding connectors **1023** extending  
20 from an axial end of the substantially cylindrical straightening head and towards the handles **1010**. In addition to forming mechanical connection with the handle portion, the attachment means also provides electrical connection between the heating means and the corresponding power source connected to the handle portions. Specifically, the attachment means comprises a pair of axially extending

rigid conductive electrodes for insertion into a socket formed on the handle portion for making electrical connection. The hair straightening surface is preferably thermally conductive for optimal heat transfer from the heating means to the hair. The cylindrical hair straightening surface is typically made of stainless steel or  
5 other appropriate thermally conductive materials.

The handle portion **1010** comprises a pair of pivotally connected arms **1011** or handles which can be movable between the “fully-opened” and the “fully-closed” positions. In the fully-closed position, when connected with the styling hair, hair will be engaged between the cylindrical hair straightening surfaces of the  
10 pair of straightening heads. During the fully-opened position, the cylindrical hair straightening surfaces of the straightening heads will be moved away from each other so that hair between the pair of straightening heads will not be subject to compressive force by the straightening heads.

The pair of pivotally connected handles is joined together under spring bias  
15 so that the pair of pivotal arms will be urged towards the fully-opened position when no closing tension is applied to them. A pair of axially extending shafts **1012** protrudes from the free, un-pivoted end of the handles. The axially extending shafts reinforce the compressional strength and enhance the rotational stability of the rotating heads. An electrical lead **1013** for connecting mains power supply to  
20 the hair straightener is connected to the hinged end of the pivotal arms. Each of the pivotal arms comprises a hollow housing so that electrical wiring for supplying power to the heating means can transit from the electrical lead to the un-pivoted free ends of the handle portion. An electrical switch **1014** for controlling the power supply to the heating means is connected in series with the heating means and

the electrical lead so that a user may turn on or off power supply to the heating means or change the heating power level.

Electrical connection between the handle portion and the straightening head is via a rotary-type electrical connection. The rotary-type connection  
5 comprises a pair of axially extending electrodes **1023** which are detachably connected to an insulated collar **1015**. The insulated collar **1015** is rotatably mounted about the shaft **1012** and comprises a pair of electrode receiving sockets **1017**. The electrode-receiving socket comprises an axially extending trough with a conductive seat for making detachable electrical coupling with the electrode.  
10 The sockets **1017** for making rotary-type connection with the electrodes of the rotatable straightening heads are disposed on the handles and proximal to the free, un-pivoted, ends of the handle portion.

The conductive seat comprises a bulb-shaped conductive brace with a resiliently and radially expandable front aperture for detachable and compressing  
15 holding of the electrode. The depth and width of the seats and troughs are adapted so that the electrodes can be seated securely and comfortably with good electrical connection when mounted onto the handle. A pair of axially displaced circumferential conductive rings is attached to the insulated collar **1015**. The pair of axially displaced conductive rings **1171** are respectively connected to the live  
20 and neutral wires via a respective pair of conductive spring plates **1172** which extend from the main housing towards the shaft **1012** so that the conductive rings are electrically connected to the mains power supply during rotation. The conductive seats and rings may be made of copper, graphite, stainless steel or other appropriate conductive materials.

Although the electrodes and the troughs are symmetrically disposed about the shaft axis in the present embodiment, it will be appreciated that they can be non-symmetrically disposed without loss of generality.

Mechanical fastening means are provided respectively on the styling  
5 heads and the handles to hold the styling heads during use. An example of such mechanical fastening means is a "lock-ring" type connector **1018** disposed at the approaching ends of the styling heads and the handles. In addition, a spring clip **1019** is provided at the front end of the styling head for resilient and compressive retention of the styling head on the shaft.

10 As can be seen in Fig. 5, when the straightening heads are attached to the handle portion with the pair of electrodes fastened onto the semi-circular seats formed on the circumferential groove, the heating elements will obtain operating electrical power from the pair of electrodes while the straightening head is rotatable relative to the handle portion.

15 Turning now to the operation of the hair straightener, when hair straightening is required, strains of hair are placed in the space between the straightening heads of Fig. 6. The pivotal arms are then pressed towards each other so that the pair of straightening heads will be moved towards each other, whereby hair is compressively engaged. The pair of straightening heads is then  
20 moved along the hair length of the strains of hair by, for example, sliding the straightener downwards towards the free ends of the hair. The friction between the hair and the cylindrical straightening heads will cause relative rotation of the straightening heads with respect to the hair. The heat at the surface of the flat cylindrical hair straightening surface of the straightening hair will cause



straightening of hair while the straightening heads are rolling along the hair. As the rotatable heads are pressing against the strains of hair while moving along the hair, the hair can be straightened with less tension required. Furthermore, straightening heads of various longitudinal and transversal dimensions can be  
5 utilized since the rotational straightening heads can be detachable from the handle portion.

Referring to Figs. 7 and 7A, there is shown a hair curler **1002** illustrating a fourth preferred embodiment of the present invention. The hair curler comprises a pair of pivotally connected handles **1011** and a pair of elongated styling members  
10 **1030** which are for detachable connection to the un-pivoted ends of the handles. In this preferred embodiment, the styling members comprise a pair of curling heads. Each curling head comprises an elongated and cylindrical barrel with a salient hair curling surface **1032**. As shown in Fig. 4A, the salient surface on the curling head of the present preferred embodiment comprises a plurality of  
15 circumferentially disposed and radially protruding curling teeth **1033** which taper away from the longitudinal axis of the curling head. The curling teeth on the pair of curling heads are substantially complementary so that the protruding teeth of one curling head will be received substantially within the trough **1034** between adjacent teeth on the corresponding curling head.

20 Similar to the hair straightener, the curling heads are inserted axially along the protruding shafts of the handle until the electrodes, which are also axially extending electrically pins, are seated within the concentric and circular conductive grooves and in close electrical contact therewith. At that instant, the curling head will be fastened onto the handle by, for example, a lock-ring like

fastening means. For optimal thermal transfer, the salient surface, including the protruding teeth, is formed of thermally conductive materials such as stainless steel. During use, hair is clamped between the curling heads and engaged between the curling teeth with the salient curling surfaces in complementary engagement. The hair curler is then slid along the engaged strains of hair and the heated salient members of the curling heads will then press and curl the engaged hair strains. Similarly, as the curling heads are rotatable relative to the handle, hair can be curled with less tension. It will be appreciated that the dimensions of the salient teeth members **1033** can be varied according to the degree of curl required by a user. This could be accomplished by, for example, providing a plurality of hair curling heads with corresponding and complementary salient curling surfaces. As an alternative, heated conductive spurs can be dispersed on the cylindrical surfaces of the curling head to achieve hair curling.

Figs. 8, 9A and 9B illustrate an exemplary fifth preferred embodiment of a hair styling iron of this invention. The hair styling iron **2100** comprises a handle **2110**, a first styling head **2120** and a second styling head **2130**. The handle **2110** is tong-shaped and comprises a first handle portion **2101** and a second handle portion **2103**. The first handle portion **2101** and the second handle portion **2103** are connected at a conjunction end **2105** and are pivotable about a hinge **2107**. The hair styling iron **2100** can be operated between an open position to capture (or release) hair and a closed position (as shown in Fig. 8) to clamp and further to curl or straighten the hair captured. A torsion spring (see Fig. 9A) is provided at the hinge **2107** to urge the handle portions **2101**, **2103** away from each other and towards the open opposition. Therefore, when the exemplary curling iron **2100** is in use, the user will need to press the handle portions **2101**, **2103** together for hair

clamping. A power cord with a swivel head **2109** is connected to the conjunction end **2105** so that electric power can be supplied to the styling iron **2100**. The swivel head **2109** arrangement allows relative rotational movements between the hair styling iron **2100** and the power cord so that twisting of the power cord can be mitigated. A switch **2111** is provided on the first handle portion **2101** so that heating power to heaters on the styling heads can be turned on or turned off.

The first and the second handle portions comprise a hollow housing made, for example, of durable plastics, and electrical connection mechanisms to be explained in more detail below are accommodated in the hollow housing. A optional or additional hair clamp **2190** is provided on the first handle portion so that hair can be clamped between the first styling member **2121** and the additional hair clamp **2190** for additional styling options. The additional hair clamp is hinged at near the non-hinged end of the first handle portion with the clamping member extending substantially parallel with the first styling head when in the hair clamping position.

The outer surfaces of a corresponding pair of styling members in combination define the hair styling characteristics to be achieved. Each of the styling heads comprises a rotatable styling member with distributed electric heating means disposed underneath or near its internal surfaces for good thermal conduction. Although resistive heating means are commonly used, it will be appreciated that other heating means, for example, infra-red heating, can be used. The styling member comprises an elongated body which is rotatable about its longitudinal axis **2131** which is substantially orthogonal to the pivotal axis of the hinge **2107**. A typical styling member comprises a hollow metallic barrel of a

cylindrical cross-section, although it may be coated with a layer or ceramics or other appropriate materials and other cross-sectional shapes can be used.

In this preferred embodiment, the pairs of styling head and handle portions are substantially identical. Therefore, only an exemplary pair of styling head and  
5 handle portion will be described, although it will be clear to persons skilled in the art that arrangements of the pairs of handle and styling head combination may be different.

Turning now to an exemplary interconnection between a styling head **2130** and a corresponding handle portion **2103**. An adaptor **2140** comprising an  
10 elongated hollow housing made of an insulating material, such as durable plastics, and with a substantially cylindrical cross-section. The adaptor is fixedly mounted to one end **2133** of the styling head which is proximal to the handle portion. Fastening means, for example, screws **2141**, can be used to fasten the adaptor **2140** to the styling head **2130** so that both will rotate together during use. The  
15 elongated adaptor housing is then inserted into the interior hollow space of the handle portion **2103**. The hollow housing of the adaptor **2140** comprises a hollow interior **2143** through which electrical wiring interconnecting the heating means and the power source can run. Specifically, a pair of wires **2145** for connecting the heating means inside the styling head with a pair of conductive bushes (or  
20 brackets or bearings) **2147** are attached to the internal surface **2149** of the hollow housing of the adaptor. The wires extend from the proximal end **2133** of the styling head **2130**, through the interior space **2143** and to near the distal end **2149** of the adaptor. The bushes are typically made of metal, such as copper, nickel coated copper and etc., or non-metal, such as graphite. A pair of electrodes (not

shown) is provided at the proximal end of the styling head **2130** for more convenient connection between the heating means and the wires **2145**.

As is apparent from Figs. 9A and 9B, the wires **2145** extend radially outward at near the distal end **2151** of the adaptor **2140** to connect with a pair of  
5 conductive bushes or rings **2147**. The conductive bushes **2147** are fixedly attached to the adaptor **2140** and are exposed on the exterior of the adaptor housing. Each bush (or bearing) **2147** has a closed circular configuration matching with the profile of the adaptor **2140**. A circular bush will ensure continuous power supply from a compatible power source brush on the handle  
10 portion when the combined styling head **2130** and adaptor **2140** rotate relatively to the handle **2110** during use.

To ensure continuous and un-interrupted power flow from the power source to the heating means while the styling heads are rotating, a conductive brush **2153** which facilitates electrical connection between the movable styling head and  
15 the handle by mechanical contact is provided. This conductive brush **2153** is mounted on the main housing of the handle **2110** and extends inwardly towards the conductive bushes **2147**. The conductive brush is configured so that it is always in compressive contact with the bushes **2147** for good electrical contact. An exemplary contact brush is as shown in Fig. 9B and comprises a spring like  
20 bearing plate. This contact brush is curved and extended for approximately a quarter circle to ensure an adequate contact surface is provided between the bush **2147** and the brush **2153**. Steel, copper alloy or other spring resilient conductors are examples of conductors suitable for use as contact brushes. Alternatively, resilient conductive brackets or bushes which are configured to be always in

compressive contact with the bushes can also be used without loss of generality. An example of such brackets is washer-like brackets with opened ends which are adapted to embrace a correspondingly shaped and sized contact bush under compressive contact.

- 5           In order to stabilize the styling heads when mounted on the handle portions, a plurality of circular protrusions are formed and distributed along the length of the hollow housing of the handle portions. These circular protrusions serve as bushes which allow smooth relative rotation between the adaptor **2140** and the housing of the handle while limiting adverse space between the adaptor and the housing to
- 10           alleviate adverse lateral movements of the styling head so that safety can be enhanced. A corresponding plurality of circumferential grooves may be formed on the outside of the adaptor to lock the styling member in place.

- In use, the power cord is connected to the mains and the switch is tuned on. When the styling member is sufficiently heated, the handle is open to capture
- 15           tresses of hair to be treated. Due to the rotatable styling heads, which are straightening heads in this instance, a use can straighten a length of hair but rolling the styling heads towards the free ends of hair.

- It can be understood from the above that heat loss can be significantly reduced since electricity is now supplied directly to the heating means disposed
- 20           on the rotatable styling heads. In addition, alternatives can be made to the exemplary embodiment. For example, the styling member can be made as a barrel of a suitable resistive heating material so that the styling member is self-heated. In that case, electricity is supplied to the barrel directly for direct heating.

It will be appreciated that the same numerals have been used to represent the same, equivalent or common parts wherever appropriate as the embodiments comprise many common parts.

While the present invention has been explained by reference to the  
5 examples or preferred embodiments described above, it will be appreciated that those are examples to assist understanding of the present invention and are not meant to be restrictive. The scope of this invention should be determined and/or inferred from the preferred embodiments described above and with reference to the Figures where appropriate or when the context requires. In particular,  
10 variations or modifications which are obvious or trivial to persons skilled in the art, as well as improvements made thereon, should be considered as falling within the scope and boundary of the present invention. For example, although the invention has been described with reference to tong-shaped apparatus, it would be appreciated that a hair styling attachment with a styling roller having a built-in  
15 heating means can be readily used with a rod-type device.

Furthermore, while the present invention has been explained by reference to hair straightener and hair curlers, it should be appreciated that the invention can apply, whether with or without modification, to other hair care apparatus without loss of generality.

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